D/H AND $^{15}N/^{14}N$ ISOTOPIC RATIOS IN ORGANIC MATTER OF ULTRACARBONACEOUS ANTARCTIC MICROMETEORITES.

N. Bardin[1], J. Duprat[1], C. Engrand[1], G. Slodzian[1], D. Baklouti[2], E. Dartois[2], R. Brunetto[2], L. Delauche[1], M. Godard[1], T.-D. Wu[3], J.-L. Guerquin-Kern[3]. [1]CSNSM, Univ. Paris Sud, Bat 104, F-91405 Orsay (Noemie.Bardin@csnsm.in2p3.fr), [2]IAS, Univ. Paris Sud, Bat 121, F-91405 Orsay, [3]Institut Curie; INSERM; CNRS, F-91405 Orsay.

Introduction: Micrometeorites, extracted from ultra-clean snow near the CONCORDIA station in the central regions of Antarctica, are interplanetary dust particles well preserved from terrestrial weathering [1]. From such collections, it is possible to recover Ultracarbonaceous Antarctic Micrometeorites (UCAMMs) characterized by a high concentration of organic matter (OM) (> 50 vol%) [1, 2]. The OM of UCAMMs exhibits extreme deuterium excesses [1] and is nitrogen-rich with bulk atomic N/C ratios ranging from 0.05 to 0.12, suggesting that the OM of UCAMMs may have endured long-term irradiation at the surface of N-rich icy bodies beyond the trans-Neptunian region [3]. We present data on the hydrogen and nitrogen isotopic compositions of an UCAMM to shed light on the nature of its OM.

Methods: We analyzed an UCAMM fragment (DC94) crushed in a gold foil using the NanoSIMS-50 ion microprobe at Institut Curie (Orsay). We obtained secondary ion images of poly-atomic species (C_2H^-, C_2D^-, $C^{14}N^-$ and $C^{15}N^-$) using a high mass resolution (HMR) protocol [4]. We also measured elemental ratios (C_2^-/CH^- and C_2^-/CN^-) on the same areas. We calibrated the instrumental mass fractionation (IMF) using dedicated hydrocarbon and natural standards [5]. The data were acquired on six overlapping areas of 50×50µm², covering the entire surface of the fragment (125×135µm²).

Results: The hydrogen and nitrogen isotopic images allow to establish spatial correlations between the heterogeneous distributions of the D/H and $^{15}N/^{14}N$ ratios. The bulk of the OM is characterized by large D/H variations (with an average $\delta D \sim 3000$ ‰) and a moderate ^{15}N enrichment ($\delta^{15}N \sim 60$ ‰). Some areas exhibit extreme D excesses (δD up to ~ 24000 ‰) associated with large ^{15}N excesses ($\delta^{15}N$ up to ~ 1000 ‰). The isotopic maps together with their corresponding N/C and H/C maps suggest that the OM of UCAMMs contains different phases. Coupled TEM and C-, N-XANES STXM maps obtained on an UCAMM from the Japanese collection [6] and on two other UCAMM fragments from the CONCORDIA collection (DC18 and DC65) [7] also point towards the presence of at least two phases in this OM. The UCAMMs allow to study the association of OM and minerals in well preserved cometary dust.

Acknowledgments: The CONCORDIA station is a joint project of IPEV and PNRA. This study was funded by the ANR project OGRESSE (11-BS56-026-01), DIM-ACAV and by CNES. We thank the PICT-IBiSA imaging facility in the Institut Curie.

References: [1] Duprat J. et al. 2010. *Science* 328: 742-745. [2] Nakamura T. et al. 2005. Abstract #5046. *Meteoritics & Planetary Science* 40 [3] Dartois E. et al. 2013. *Icarus* 224: 243-252. [4] Slodzian G. et al. 2014. *Microscopy & Microanalysis* 20(02): 577-581. [5] Bardin N. et al. 2014. Abstract #2647. 45th Lunar & Planetary Science Conference. [6] Yabuta H. et al. 2012. Abstract #5196. *Meteoritics & Planetary Science* 75. [7] Engrand C. et al. 2015. Abstract #1902. 47th Lunar & Planetary Science Conference.